

## ABSTRACT

The present invention is directed to an excavator that is operable in manual and automatic modes and uses state machines to effect unit operations, rotationally offset swing actuators to rotate boom and cutter head, a fail safe hydraulic system to maintain gripper pressure in the event of a malfunction of the hydraulic system, differing position and pressure control functions in the hydraulic actuators, a kinematic module to effect pitch and roll adjustments, a cutting face profile generator to generate a profile of the excavation face, and an optimization module to realize a high degree of optimization of excavator operation.